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Antigen Interactions

Antigen-Antibody Interactions

- **Antigen-antibody interactions** involve **reversible** formation of **multiple noncovalent bonds** between epitope and paratope
  - The **spatial complementarity** required is based upon the **electron cloud shapes** of both epitope and paratope<>
  - **Overall** epitope and paratope **configuration**, which determines the **availability of electrons for interaction**, is more important than the nature of the atoms involved (e.g., note the cross-reactivity of benzoate, phenylarsonate and benzenesulfonate with antibodies prepared against benzenesulfonate)<>
  - The **lock and key relationship** between epitope and paratope is enhanced by **induced fit** (~1 angstrom at the peptide backbone level, and more at the side chain level) due to their **mutually deformable conformations**
- **Intermolecular interactions** between side chains of epitope subunits and those of the paratope include these **noncovalent interactions**
  - **Electrostatic interactions**
    - **oppositely charged ionic groups**, such as carboxyl and amino groups, attract each other<>
    - **force** of these interactions is **inversely proportional to the square of the distance between the charges**
      - **mutual attractiveness between them increases exponentially** as the charged groups come closer together<>
      - **displacement of water molecules**, with their high dielectric constant, increases the force of these interactions
  - **Hydrogen-bonding**
    - **reversible hydrogen bridges** between hydrophilic (hydroxyl, amino and carboxyl) groups<>
    - **relatively weak, essentially electrostatic interactions** that are enhanced by displacement of water molecules<>
  - **Van der Waal's forces**
    - depend upon **interaction between external electron clouds** that lead to **induced dipole interactions**<>